**E907 RICH VME COMMANDS**
**3/19/2003**
**Terry Kiper**

The micro controller data link on both the VME and Readout board no longer defaults to character echo mode. This means that if a terminal or PC is connected using the LVDS interface board the user will not see any response. To enable echo on the VME controller enter command 'ON'. After the readout board has been powered up or reset enter the command 'ON FF' or 'ON 00'. Use the command 'WU 00' to initialize the readout link. Initialing will turn off character echo. If the link did initialize you can now connect to any readout node with the command 'ON nn' with nn equal to 1…n boards. If the link only has one readout board the command 'ON 1' and 'ON FF' will both work. The readout command prompt will display board number (00> not initialized, 01> initialized).

Each block commands uses reserved dual port memory for boards 1-31. The single commands will use reserved dual port memory for board zero. This data is then sent out as a global command to all readout boards. Once the link has been initialized and the correct number of boards is responding the command 0x00 can be used to send all the setup data.

**VME COMMANDS (0x0 - 0x12)**

- 0x00 *Write* Ch_Ena, T_Holds, P_Delay, and T_Pulse Blocks to all boards.
- 0x01 *Write* Threshold data Block.
- 0x02 Read Threshold data Block.
- 0x03 *Write* Threshold data Single.
- 0x04 Read Threshold data Single.
- 
- 0x05 *Write* Channel Enables, Block.
- 0x06 Read Channel Enables, Block.
- 0x07 *Write* Channel Enables, Single.
- 0x08 Read Channel Enables, Single.
- 
- 0x09 *Write* Pipeline Delay, Block.
- 0x0A Read Pipeline Delay, Block.
- 0x0B *Write* Pipeline Delay, Single.
- 0x0C Read Pipeline Delay, Single.
- 
- 0x0D *Write* Test Pulse amplitude Block.
- 0x0E Read Test Pulse amplitude Block.
- 0x0F *Write* Test Pulse amplitude Single.
- 0x10 Read Test Pulse amplitude Single.

- 0x11 Resets Readout boards on link, Send 'WU FF'.
- 0x12 Initialize Readouts as incrementing nodes (1…n), Send 'WU 00'.

- *Board setup commands (0x20-0x50) used during early testing.*
- 0x20 Set Threshold all 50mV, Sends 'TP 50'.
- 0x30 Set Test Pulse all 2000mV, Sends 'PU 2000'.
- 0x40 Set Ch Enable all on, Sends 'W5 0 FFFFFFFF'.
- 0x50 Testing, set Pipeline Delay all 0x17(18.5nS per), Sends 'W9 0 17'

**Readout Boards Input Data**

- 32 Bytes of threshold data, (8mV/bit for 0-2.048V) per channel at DAC. Each DAC channels output goes to a 10:1 divider. The 10:1 divider is linear until the DAC's voltage reaches about 500mV. This gives a linear adjustment of 0-50mV at the comparator with a DAC setting of 0-500mV.
- 32 Bits (MSB-LSB) channel enable (1==On).
- 8 Bits pipe line delay @ 18.5ns per bit.
- 12 Bits test pulse amplitude (0-2.5 volts) DAC, .6mV per bit.

If the VME command 0x12 or 'WU 00' finds any nodes on the link already initialized the following will happen. This active node will transmit a new init message 'WU FF' on its secondary link forcing all downstream nodes that are active to reset. This node itself will then reset.

Always use the VME command 0x11 *'WU FF'* first to reset all nodes. Then delay about 2 seconds and send VME command 0x12 *'WU 00'* to init the link. Read VME memory address (A24) location 0xnn7FFA for the active 'responding' board count.

The VME Cards micro controller requests status data from each Readout board. The controller sends ASCII 'SD nn' to each board on the link. The remote boards respond to the command and return data for the boards temperature and power supply voltages. The status update rate is every 15 seconds.

**Readout board LED Blink Rate**

- 1 Hz Board has not been initialized and assigned a node number.
- 5 Hz Board has been initialized and assigned a sequential node number.
- 10 Hz Board's flash memory failed to load CPLD. Data will not read back.

**VME Commands Status @ Address 0xnn7FFC**

- 0x01 Command Invalid, Ready
- 0x03 Command Valid and Finished
- 0x04 Busy (set by CPLD on each write to 0x7FFE)

- 0x06 Command Valid and Busy

The command status register will be set busy on VME interrupt. **Writes to the VME command register should only occur if busy is inactive**. The status will change when the readout micro controller has finished the command on the serial data link. Most of the commands will be slow, as the data has to be transmitted at 19200 baud on the command link. On the link init command *(0x11 or 'WU FF')* this delay is up to 2 seconds. On this command the VME status register is not updated.

**Quick Setup Test Enter VME command @ Address 0xnn7FFE**

- 0x11 "Send 'WU FF', Resets Readout boards on link."
- 0x12 "Send 'WU 00', Inits Readout boards (1…n). "
- 0x20 "Testing, Sends 'TP 50', set threshold all 50mV"
- 0x30 "Testing, Sends 'PU 2000', set Test Pulse all 2000mV"
- 0x40 "Testing, Sends 'W5 0 FFFFFFFF', set Ch Enable all on"
- 0x50 "Testing, Sends 'W9 0 17', set Pipeline Delay 0x17 (18.5ns per)"

**Trigger Inputs**

The timing signals connected to the VME card during testing at Fermilab.

| | | |
|---|---|---|
| Test Pulse | 0 ns | (Reference) |
| Strobe Pulse | 446 ns | (Pipe Line Delay of 0x17* 18.5ns) |
| Read Enable | 2.76 us | (LVDS transmits data) |